elliottwood

44 Gloucester Avenue

London

NW1

Addendum

Block E: Design Philosophy & Sequence of Works

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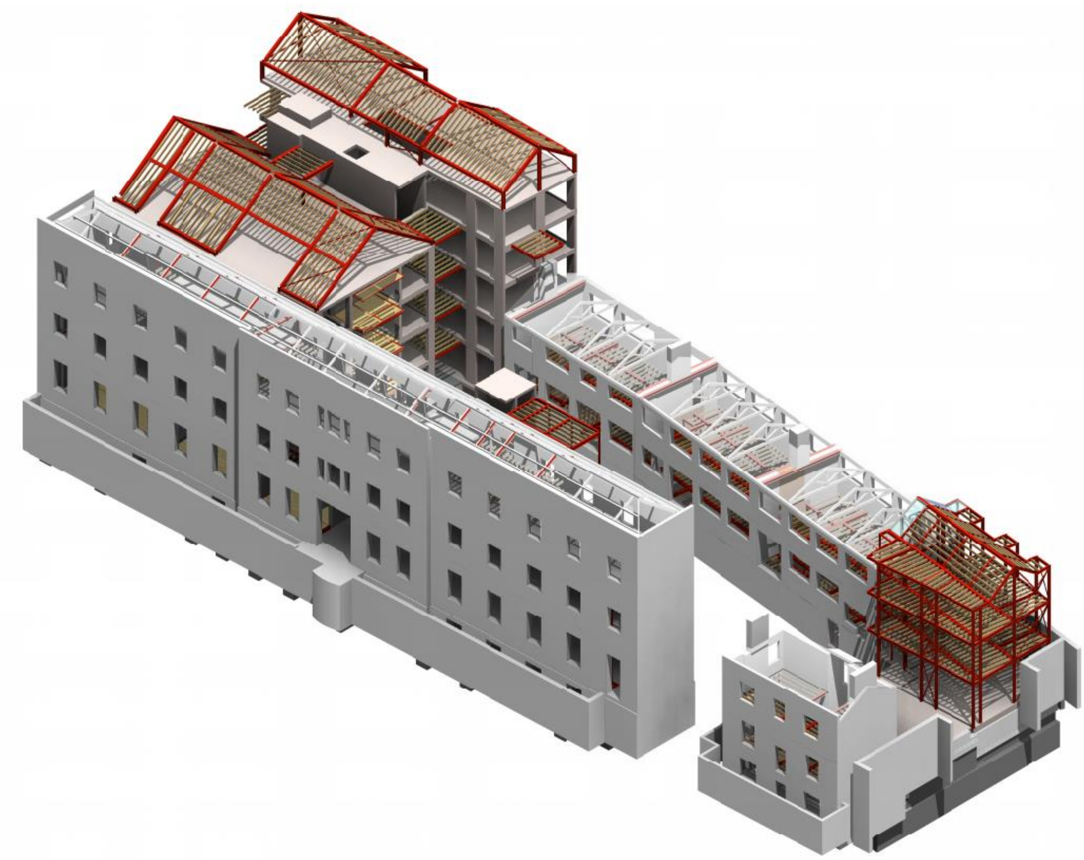

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Contents

Addendum

Structural Design Philosophy for Block E

The original design philosophy has been amended from a previously approved façade retention scheme to retention of the front and side walls and is presented below:

- The external front façade masonry wall and two gable walls are to remain in building E.
- Rear wall to be demolished and re-built approximately 1.5m further to increase floor area of the building. The existing side walls to be extended. All new walls to be load-bearing brick and block cavity construction.
- New ground, 1st and 2nd floors, as well as a new half-hipped roof, are to be constructed of steel beams w/timber joists.
- Basement floor to be lowered.
- A new single-storey underground structure to be built at the back of the building, adjacent to Block D, formed of RC raft and retaining walls, with a car park and SUDS on the ground floor (top) level. The two underground parts of the building are to form a single open-plan space at the basement level.
- Stability is to be provided by the retained solid masonry walls as well as by 4 No. of new full-height steel frames in South-North direction and a new steel box frame below the ground floor level in the East-West direction.

Sequence of Works for Block E

The following sequence of works has been assumed in the design of the permanent structure.

The sequence of works has to be reviewed and confirmed by temporary works engineer prior to commencement of works.

1. Install a sheet pile wall outside of the rear wall to protect the existing building – as per temporary works engineer's design.
2. Excavate the ground at the back of the existing building to the bottom of the proposed raft foundation.
3. Construct the new raft foundation, external retaining walls, internal 'step' in the basement slab (gridlines P/13 to P/14). Steel elements of the box frame to be embedded in concrete.
4. Finalise construction of the box frame.
5. Excavate and locally cut back the existing corbel foundations at the front façade.
6. Construct the new RC strip foundation along the front façade.
7. Install 4No. of new steel columns at the front façade.
8. Prop the existing floor at the ground level and cut through locally to allow for installation of new steel floor beams.
   (Alternatively: Existing floors can be removed subject to temporary works design.)
9. Install new steel floor beam at the ground floor level. Beam to be supported on the new steel column at the front façade and the steel box frame at the rear façade.
10. Construct new masonry wall forming the rear façade, up to the 1st floor level.
11. Repeat steps 8 to 10 for each floor.
12. Once the new building is constructed, the existing structure can be demolished top-down.
13. Remaining parts of the basement slab to be constructed.

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Design Philosophy

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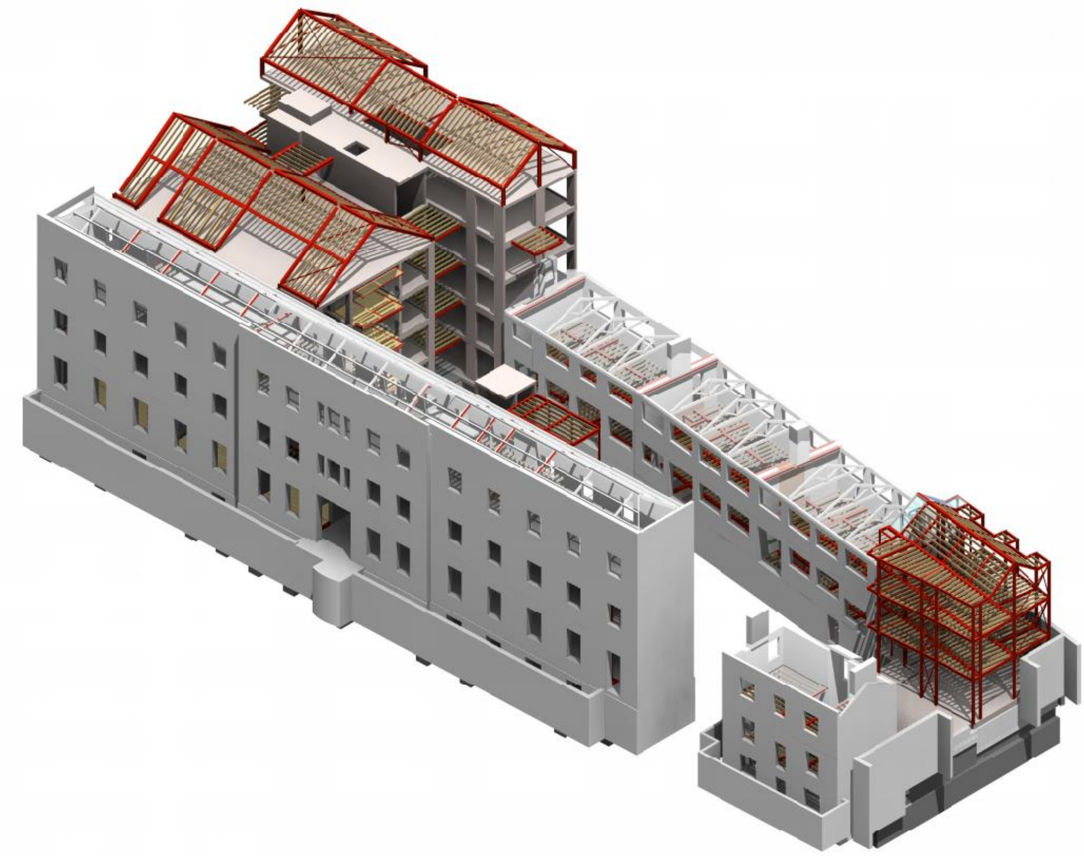

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Contents

Structural Design Philosophy

The aim of this document is to provide background information about the existing buildings at 44 Gloucester Avenue and to introduce the structural and below ground drainage works. It should be read in conjunction with the structural and below ground drainage drawings and specifications.

1. Design Statement

1.1. Introduction

Elliott Wood Partnership LLP have been appointed by Pears Property Advisory Services Ltd to provide Civil and Structural Engineering services for the proposed development at 44 Gloucester Avenue. The project involves two core components; retention and refurbishment of the existing listed buildings on the site, and the demolition and replacement of existing buildings to the South East and North West of the site including new basements.

The purpose of this report is to provide background information about the existing buildings at 44 Gloucester Avenue and introduce the structural works to be undertaken. It should be read in conjunction with the structural drawings.

1.2. Existing Buildings

The site is located in a prime residential area within the London Borough of Camden. The site is bounded by Gloucester Avenue to the west, the main Euston railway line to the East and residential & commercial properties to the North and South. The Grand Union Canal is located 50m south east of the site. Refer to Figure 1 for site location sketch.

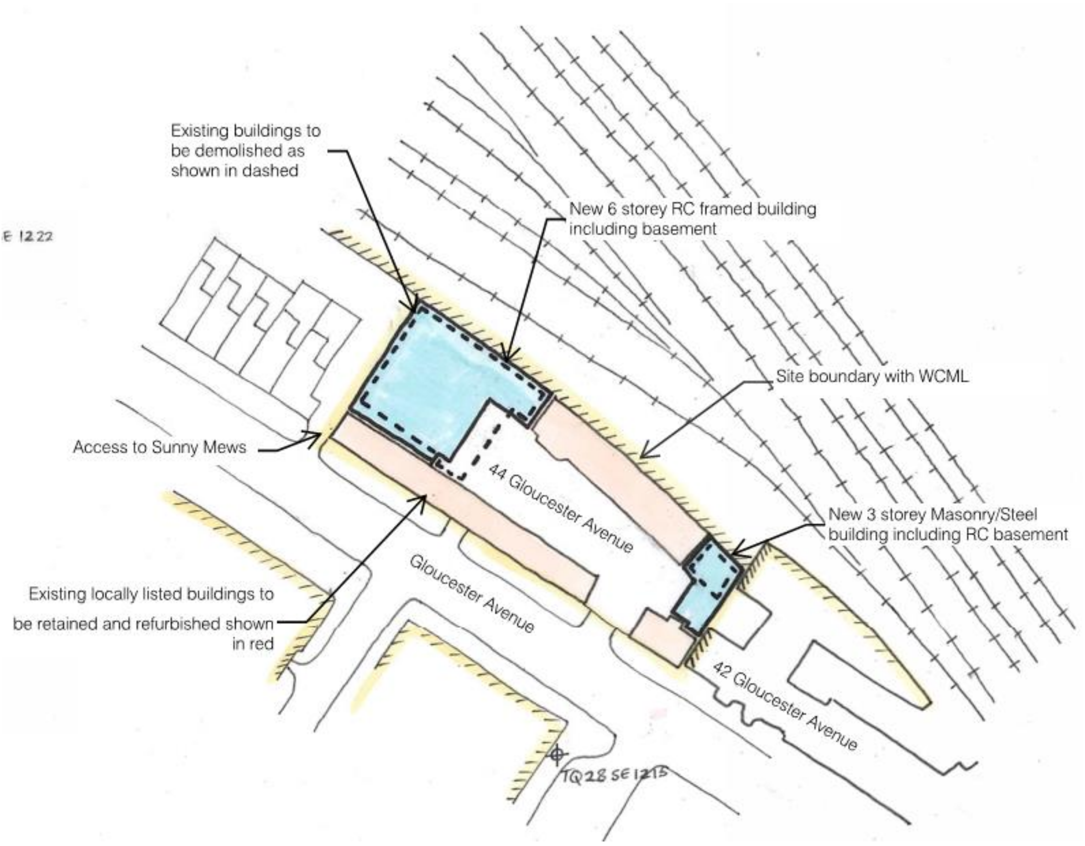

Figure 1 Site Plan

Network Rail land directly adjoins the site and the neighbouring railway, the West Coast Main Line (WCML), at its closest point runs approximately 10m North East of the site. The WCML is a primary rail route into London Euston. Adjacent to the site, the railway is 5 tracks wide and electrified with overhead lines up to 5m from the site with sidings alongside the property for cleaning and rolling stock. There is a listed subterranean structure adjacent to the site below the railway lines. This consists of a 19th century vaulted masonry structure by Robert Stephenson. It's exact location, size and depth is unknown however an indicative outline of the structure is shown in figure 2.

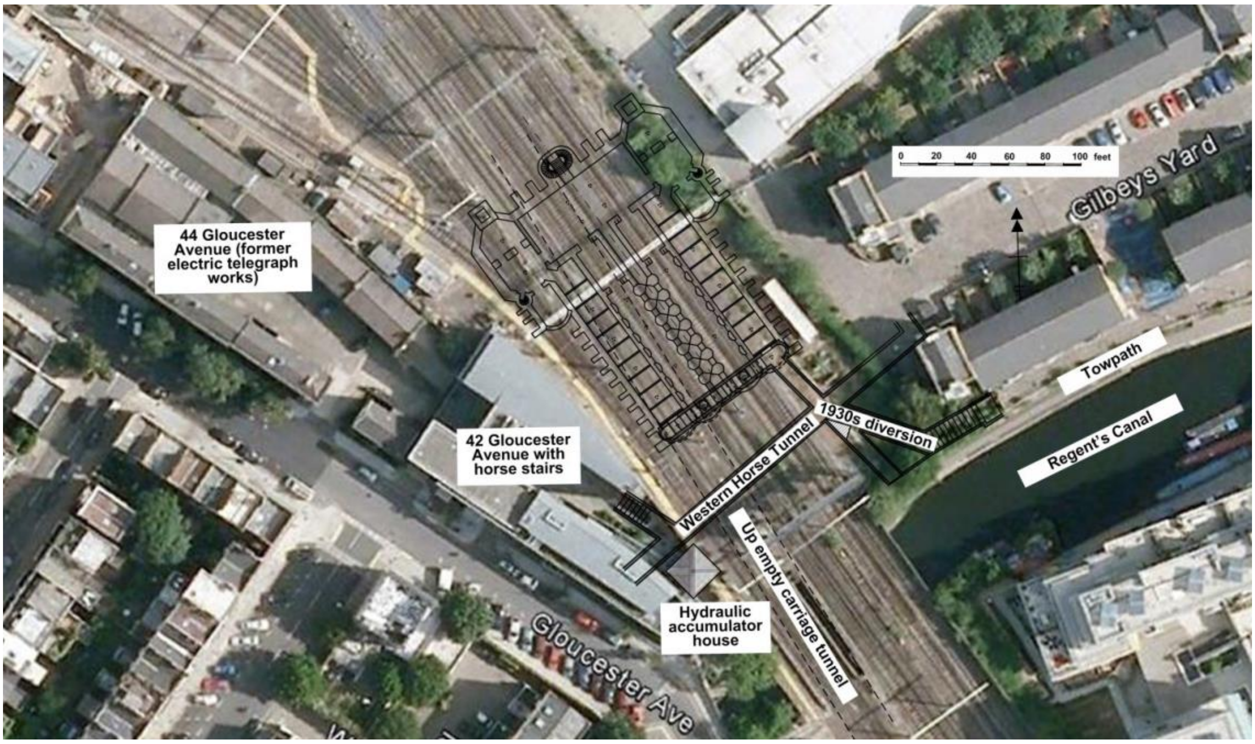

Figure 2 Assumed location of the subterranean vaulted masonry structure

Historic maps show buildings to the NE and SW of the site date back to the pre 1870s and the adjoining structure to the North to be pre 1890s. There is no evidence of redevelopment of the site since these dates however from site inspection it appears that the existing buildings have undergone various historic internal alterations. Nearby, more recent developments have been built to the North West of the site following the destruction of 48-50 Gloucester Avenue during WWII. There is also a more modern development to the South East of the site, although there is no indication of bomb damage in this area from bomb damage maps.

The site comprises of a series of existing warehouses and office buildings arranged around a central external hard landscaped courtyard. The existing buildings vary in size. The locally listed buildings facing Gloucester Avenue are 4 stories with a basement incorporating a front light well, and the locally listed buildings to the rear are 3 stories incorporating a basement.

The warehouses adjacent to the railway were found to be in a generally poor condition with the exception of the existing masonry walls which were in a fair condition. The structure comprises of a combination of timber floors or concrete and steel filler joist floors spanning onto load bearing masonry. In some locations steel has been incorporated into the building at a later date where load bearing masonry has been removed or the existing timber beams have decayed. The roof structure is timber trusses spanning the width of the structure with timber rafters. The foundations appear to be shallow strip foundations from the site ground investigation. The basement slab construction is consists of a mass concrete ground bearing slab.

The existing Victorian terrace which faces Gloucester Avenue was found generally in acceptable condition. The structure comprises of vaulted masonry floors supported onto steel beams spanning between the front and rear of the building. The majority of the load is taken by load bearing masonry to the front and rear of the building. Internal spine walls spanning front to back will contribute towards the lateral stability of the building. The roof compromises of a series of timber trusses. Recent works have been undertaken under a permitted development scope. Limited information has been provided on the works but available drawings and calculations have been reviewed and are included in Appendix D.

The site is within an area safeguarded against certain sub surface developments for the proposed High Speed 2 (HS2) line. HS2 documentation suggests a bored tunnel is proposed below the site. Previous correspondence with HS2 has confirmed that they intend to serve a compulsory purchase order (CPO) for subsoil at 9m below ground level and below, which is currently considered a no build zone. HS2 have noted that they must be consulted on the proposals for any sub-surface works during the planning process. Network rail have been provided with the proposed scope of work and are due to be issued with a comprehensive package including temporary works in line with the planning conditions.

1.3 Proposed Works

The proposals are to refurbish the existing locally listed buildings and to demolish and re-construct the existing buildings to the North West and South East of the site. This is to allow for construction of a new six storey building including basement to the NW of the site and a new 4 storey building including basement to the SE of the site. The development has been split into five separate buildings labelled in figure 6.

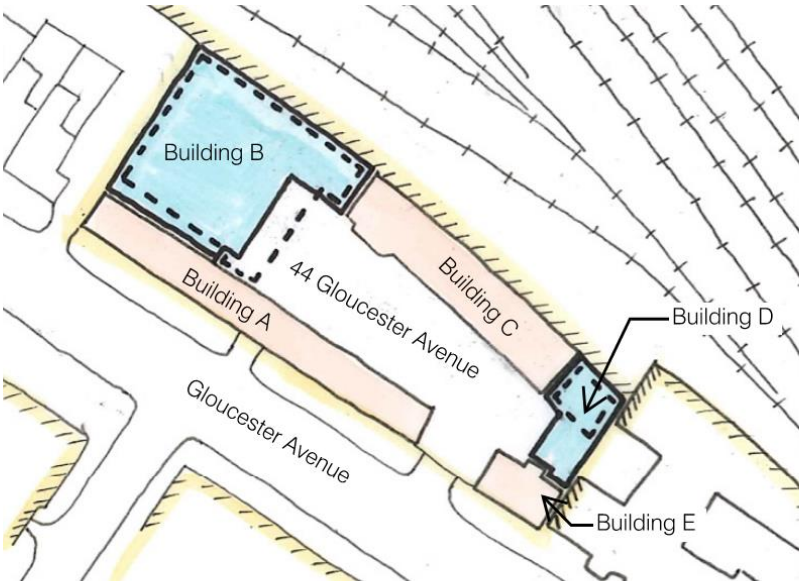

Figure 3 Block References

1.3.1 Block A

The stability of the existing Victorian terrace is provided by the internal masonry walls in conjunction with the deep vaulted floors acting as a diaphragm. The proposed works in building A are mainly centred around the refurbishment of the existing structure to suit the new architectural layout. Some of the existing internal masonry walls are to be removed and replaced with steel goal post stability frames to maintain lateral stability. At basement level there is a box frame with a ground beam bearing directly onto a mass concrete strip footing, emulating the original masonry footing. Additional lateral stability has been included in the form of new brick walls where practical.

At basement level a portion of the existing masonry wall is to be removed adjacent to building B to allow the envelope of the building to be extended out. The existing masonry wall above will be supported by a new steel frame and new concrete slab, walls and roof will form the new extension to the building.

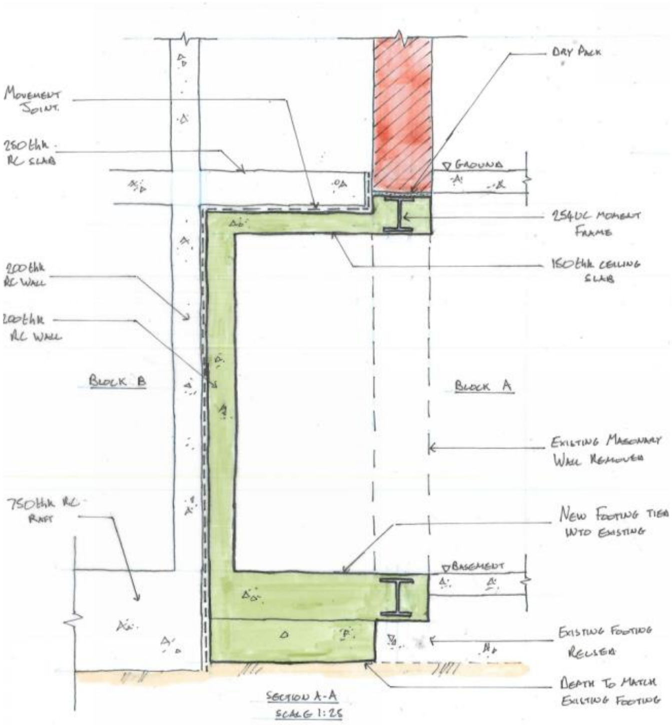

Figure 4 Block A & Block B interface

This has created an overlap of building A under building B which will require separation. A movement joint between these buildings is therefore required to allow differential movement as well as ensuring both buildings can be effectively waterproofed.

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The existing vaulted masonry floors at ground, 1st and 2nd floor are to be maintained with an additional mezzanine floor added in the duplex apartments at the top of the building. The floor will be of timber construction spanning the existing external masonry walls. New mezzanines have already been constructed as part of the permitted development scheme. The level of these is to be reviewed in the next stage to ensure they comply with the architect's requirements and new mezzanines will be constructed if required. Where works are being undertaken to the existing brick vaulted floors, the thrust from adjacent bays should be considered in the temporary works.

The existing timber roof truss will be altered to increase the head height on the mezzanine level. The bottom chord is to be removed with the remaining elements strengthened to suit with steel plates and a tension member. The steel elements will be designed irrespective of the original timber truss which will act as formwork during construction. Temporary works will be required to ensure there is no lateral spread of the frame during construction.

A new 2-storey staircase and lift is to be added outside the existing envelope of the building in the hard-standing courtyard. The structure will include a steel frame supporting a glass façade with the steel staircase providing lateral restraint to the posts – the design intent for this area is shown on the relevant drawing. The lift shaft will be constructed from concrete. The addition of this structure will remove the soil pressure on the existing retaining wall, decreasing the required lateral stability of the basement. Temporary propping to the basement walls in block A may be required depending on the proposed sequence of works. The new structure will be laterally tied to the existing structure in block A will be vertically released. This will allow the new foundations to settle relative to the existing building adjacent.

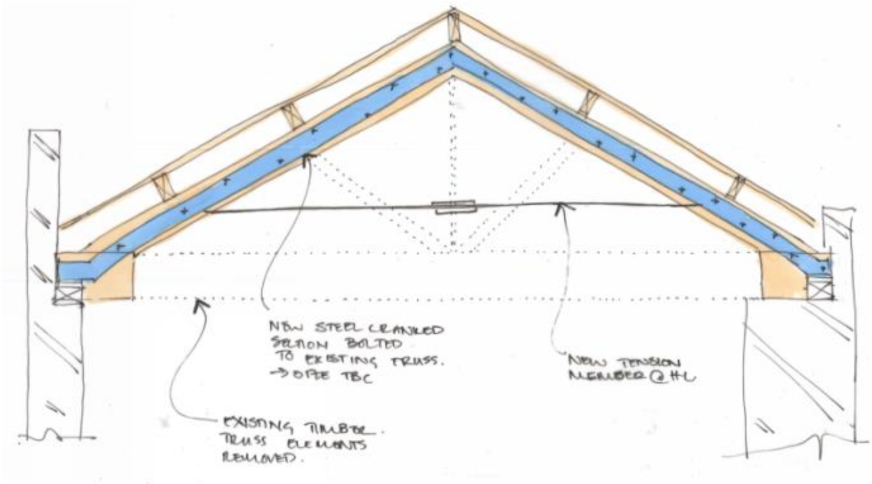

Figure 5 Block A Roof Truss

1.3.2 Block B

For building B for which the existing building and basement is to be demolished, it is proposed to construct the new basement as an enclosed stiff RC boxes. These will be constructed as separate structures to the existing buildings and isolated by the use of slip membranes and compressible materials acting as movement joints, between the new and existing structures.

The initial demolition phase will demolish the buildings down to existing ground floor slab but the slab itself is to be retained in the short term to act as the prop to the top of the existing masonry retaining wall ahead of the appointment of a main contractor.

It is proposed to increase the depth of the existing basements by approximately 1m by underpinning the existing boundary walls. The existing retaining walls are likely to have been designed as simply supported, spanning between the basement and ground floor slabs. By removing the ground floor the retaining walls will have to be laterally propped in the temporary case to prevent excessive ground movements. New reinforced concrete walls will be cast in front of the existing structures to act as the permanent retaining walls. The RC retaining walls towards the middle of the site will be constructed by battering the soil back to 45° to allow for the walls to be constructed in one phase. This soil is to be backfilled and well compacted once the new walls are constructed.

The reinforced concrete retaining walls are to be designed to resist against lateral pressures arising from soil, hydrostatic forces and surcharge loads. The foundation depth of the adjacent buildings is unknown, but is likely to surcharge onto the new retaining walls and has been included within the current proposals. The site investigation indicates that the ground water table is expected to be below the level of the proposed development. However, the retaining walls will be designed against hydrostatic pressures at 1.5m below ground level. This allows for any accidental hydrostatic pressures from, for example a burst water main or any perched ground water on the London clay. The walls will be designed as propped cantilevers spanning vertically between the basement and ground floor RC slabs. The new retaining wall will be designed for any building surcharges acting upon them from the adjacent sites. Other surcharge loads considered will include construction traffic, fire engine loading due to access available onsite for emergency services and railway surcharges.

The building foundation is proposed to be a stiff RC raft which spreads the load from the building onto the ground below. The capacity of the raft slab will be able to spread loads sufficiently so that safe bearing pressures of the clay can be designed to. Net upward forces from soil heave pressures and hydrostatic uplift pressures will be resisted by the raft in bending.

The superstructure of building B will be a 5 storey RC frame with the flat slabs at every level acting as a diaphragm to take the lateral load to the lift shaft and RC shear walls. A transfer slab is required at level +2 to accommodate the change in building envelope.

The roof structure will comprise of a series of steel portal frames with timber purlins. Where required, load will be transferred across the slab via an RC beam. Braced bays will provide stability in the perpendicular direction to the portal frames.

1.3.3 Block C

In building C, the existing masonry walls, RC basement slab and roof structure are to be maintained. Internal columns are to be removed and a new steel frame on pad stones with timber joists make up the ground and 1st floor. Lateral stability is maintained by the existing internal masonry walls which are to be retained. The chimney breast between the second and third units is to be moved up to roof level with new steels supporting the stack above.

1.3.4 Block D

The existing building D is to be demolished down to ground level. A new basement will be formed, connecting into building E's basement by underpinning the existing masonry wall footings around the outer perimeter of the site. A new RC stiff box consisting of basement raft retaining walls and ground floor slab will form the permanent retaining structure. The 2-storey superstructure will be formed of a steel frame. The 2-storey glass façade between buildings C and D will be supported by a lightweight steel frame which will be tied back to the blockwork in building D remaining independent of the existing masonry wall of building C. To comply with planning requirements for potential access to the rail winding vaults, a doorway has been included in the north wall, which is to be filled with block work until access is required.

1.3.5 Block E

The existing basement, external masonry walls and roof structure are to remain in building E. New ground and 1st floors are to be constructed of steel w/timber joists spanning the full width of the external envelope. One of the basement retaining walls will be demolished to allow the new basement to block D to connect into the existing basement in block E. Underpinning will be required in order to achieve the required lowered basement connecting this to Block D without undermining the existing foundations to block E.

2 Design Criteria

2.1 Disproportionate collapse and robustness

The proposed new building is 6 stories high and under current building regulations is classified as class 2B in accordance with BS EN 1991-1-7.

Block B is classified as a class 2B building, effective horizontal and vertical ties must be provided to all supporting building elements. The reinforced concrete will be inherently robust and ties will be provided in accordance with BS EN 1992 – Concrete.

Block A, C & D are classified as class 2A buildings. Where existing structures are to be replaced, horizontal ties will be provided. Where existing slabs are being retained, it has been assumed that they are sufficiently robust.

Block E is classified as a class 1 building and therefore no additional measures are required.

2.2 Fire Protection

The building will be designed and specified so that the reinforced concrete structural elements have sufficient cover to give the required level of inherent fire protection to the structure. Additional fire protection will be required around the substation to achieve the required 4hours protection and this should be included as part of the specification from the specialist designer.

For other structural elements, new finishes or fire retardants will be specified as part of the architectural package so as to provide the required level of fire protection to the building.

2.3 Waterproofing

The waterproofing strategy is to be developed by the architect. However, it has been assumed to be a combination of external tanking and a cavity drain system. Positions of sump pumps are to be confirmed by the architect and added to the plans. The new pumps will be housed in new RC boxes in the basement slab.

2.4 Geology and Hydrogeology

A detailed Ground Investigation and Basement Impact Assessment has been undertaken for the site by Geotechnical & Environmental Associates (GEA). The report includes details of the ground composition, soil properties and groundwater information through the drilling of three boreholes and digging of eleven trial pits and testing of the soils.

The investigation undertaken by GEA (Appendix B) has encountered the expected ground conditions as indicated on the Local British Geological Survey (BGS) maps. Below a significant thickness of made ground, a London Clay Formation was encountered and proved to the maximum depth investigated. Made ground was encountered to depths of between 3.70 m (28.85 m OD) and 4.30 m (28.11 m OD) and generally comprised brown and dark brown clayey sandy silt with variable inclusions of gravel, ash, brick, concrete, coal, charcoal, slate and chalk fragments. The London Clay comprised an initial weathered horizon of firm becoming stiff fissured medium strength to high strength brown silty clay. The initial horizon extended to depths of between 11.90 m (20.50 m OD) and 13.20 m (19.21m OD), whereupon typical unweathered

London Clay was encountered and comprised stiff becoming very stiff fissured high strength to very high strength dark grey silty clay with partings of pale grey silt. Perched groundwater was encountered in three of the Trial Pits, which were all excavated from existing basement level and groundwater was measured in the standpipes at depths of between 1.70m (30.71m OD) and 1.90m (30.50m OD).

Reviewing the local topography indicates a general movement of groundwater in the easterly direction towards the river fleet. This is likely to be in the form of perched water above the London clay and any localised ground water could be controlled locally using the form of submersible pumps. EW inspection of the trial pits undertaken by GEA during an initial site visit showed perched water above the London clay.

2.5 Ground Movement Analysis

A detailed Ground Movement Analysis has been undertaken for the site by Geotechnical & Environmental Associates (GEA), the full report has been provided as part of the Tender documentation. An assessment of ground movements within and surrounding the proposed excavations has been undertaken using the X-Disp and P-Disp computer.

The analysis has indicated that the maximum vertical settlements and horizontal movements of existing structures that will result from the combined effect of the retaining wall installation and excavation are generally less than 20 mm. The analysis also indicates that, by the time the basement construction is complete, around 15 mm to 20 mm of heave is likely to have taken place at the centre of the proposed excavations for block B and block D respectively, reducing to around 10 mm to 15 mm at the edges.

The analysis has concluded that the predicted damage to the neighbouring properties from the construction of the underpins and basement excavations would be ‘Negligible’ to ‘Very Slight’, for which the damage that would occur would fall within the acceptable limits. The southern wall of the Warehouse and two northern walls of No 42 Gloucester Avenue have been identified as Category 2 ‘Slight’ and although the walls to the latter are supported by piled foundations and are unlikely to result in such movements, mitigation measures may be required, but in general the wider site should not be of concern. It is recommended that movement monitoring is carried out on all structures prior to and during the proposed basement construction.

The analysis makes assumptions regarding the amount of loading and unloading of the soil substructure during the construction phase. These assumptions will be reviewed during the development of the design in the next stage to validate the results given.

3 Construction Methodology

This section covers the assumed sequence for the basement as currently noted in the Basement Construction Plan.

3.1 General

Some of the issues that affect the sequence of works on this project are:

- The stability of the ground, the existing building and the boundary walls during demolition
- The stability and protection of adjacent buildings
- Ensuring the safeguarding of the nearby railway
- Providing a safe working environment
- Maintaining reasonable access to the site to minimise disruption to the neighbouring properties.

The proposed works involve the construction of 2 new single storey basements and it is envisaged that the works will be completed as a bottom up type construction.

3.2 Noise and Vibration

The Contractor shall undertake the works in such a way as to minimise noise, dust and vibration when working close to adjoining buildings in order to protect the amenities of the nearby occupiers.

The breaking out of existing structure shall be carried out by saw cutting where possible to minimise vibration to the adjacent properties and associated construction noise. All demolition and excavation work will be undertaken in a carefully controlled sequence, taking into account the requirement to minimise vibration and noise.

3.3 Monitoring

Monitoring of the ground and adjacent structures will consist of visual and measured monitoring. Prior to commencing works, the Contractor will provide a schedule of condition of all adjacent properties with photographs agreed with relevant Party Wall Surveyors. The locations for monitoring targets and trigger limits will also be agreed. Monitoring will take place on a weekly basis during the main demolition and construction works. For any movements recorded above the agreed limits, all works stop until the cause of the cracking can be established and a solution developed and agreed with Elliott Wood. Before commencement of excavation works, targets will be set to ensure that any movement during excavation is within allowable limits.

Visual monitoring the adjoining structures and highway will be carried out during the works to monitor any cracking that may occur. The structure will be designed to prevent any cracking above Burland damage category 2 (cracks >5mm), however if this does occur, all works will stop until the cause of the cracking can be established and a solution developed and agreed with Elliott Wood.

Due to the access restrictions of the Network Rail Assets, it is likely that remote monitoring will need to be set up to record any movements of the adjacent railway. Close correspondence with network rail will be required to ensure that any movements are kept below an agreed threshold level.

3.4 Stage 1: Site Set-Up

3.4.1 Erect a fully enclosed site hoarding. Hoarding will not impede pedestrian use of Gloucester Avenue

3.4.2 The services within and around the site should be identified and isolated as necessary. All below ground obstructions should be removed to allow the works to progress.

3.4.3 Set up suitable tree protection measures as identified in the arboriculturalist's report.

3.5 Stage 2: Enabling Works & Soft Strip

3.5.1 The principle for removing spoil and storing materials will be agreed. Given the scope of works and site layout it is likely that spoil will be and loaded directly onto grab lorries to be removed from site.

3.5.2 The Contractor will set up the site accommodation and welfare facilities within the existing car park, within one of the retained existing buildings or in the internal courtyard of the site.

3.5.3 Any retained finishes are to be protected. During soft strip, the existing buildings are to be assessed for any visible signs of distress. If required EW will advise if remedial measures are required to improve overall robustness.

3.6 Stage 3: Demolition of the Existing Structures

3.6.1 The demolition contractor is to establish a sequence that maintains the stability of the existing buildings and retaining walls at all times during the building demolition.

3.6.2 The Permanent Works Contractor shall provide adequate temporary support prior to any structural demolition to ensure the stability of the party walls and adjacent structures throughout the works.

3.6.3 All temporary works will be installed prior to demolition works commencing and will remain in place until the permanent structure has been completed.

3.7 Stage 4: Bulk Excavation to a Reduced Level

3.7.1 During excavation stages and basement construction, the Contractor shall provide all temporary support to ensure the stability of the ground and adjacent structures is maintained. All props will be installed prior to demolition, or in a sequence during excavation works that maintains stability of new and existing structures. All props will remain in place until the permanent structure has been completed.

3.7.2 To allow for the demolition of the existing basements the contractor will excavate to a level just below the existing ground bearing slabs but above the level of the existing foundation formation level. Any existing strip foundations to be removed will be demolished locally at this stage to ensure the retained foundations are not undermined.

3.7.3 The perimeter basement walls will be retained and used as temporary retaining structures. The contractor shall provide temporary support and lateral restraint to the retained masonry basement walls in the form of waling beams installed just below existing ground level and above existing basement floor level with flying props and diagonal braces.

3.7.4 If any groundwater seepage is encountered submersible pumps will be used to keep the excavation dry.

3.8 Stage 5: Mass concrete underpinning

3.8.1 Following the demolition of the ground floor slab, the contractor should undertake trail pits to confirm the exact depth of all existing foundations. Elliott Wood will then inspect to observe how well the existing soil is cemented and in particular its ability to "stand up" during excavation. Localised lenses of sand/ silty material may require additional shoring to the underpin excavation pits.

3.8.2 Once the Contractor's method statement has been reviewed the mass concrete underpinning to the existing walls can be completed. The single stage underpinning will be carried out in 1m sections. The existing corbelled foundation will be trimmed back to the face of the wall. Each underpin will be left to cure for 3 days and then dry packed to the underside of the wall with 3:1 sharp sand to cement dry pack well rammed in. Once each underpin is complete the local excavation will be backfilled.

3.9 Stage 7: Bulk Excavation to Formation Level

3.9.1 Due to the variable made ground thickness on site, the Contractor will excavate the basement area to a depth where the formation area consists only of London Clay. The site investigation indicates that this will be approximately 400mm below the proposed formation level.

3.9.2 The piles will be broken down as the excavation progresses until the pile cut off level is reached.

3.9.3 The existing basement walls and underpinned foundations will act as temporary retaining structures and will be propped at the head and base, and additional locations as required to resist overturning and sliding forces during the basement construction. The remaining sides of the basements will be excavated by battering back the soil into the central courtyard area at a maximum of 45° to horizontal.

3.10 Stage 8: Drainage, Basement Slab and Retaining Walls

3.10.1 To provide a uniform bearing strata, the Contractor will backfill from excavation level to formation level with well graded granular fill compacted in 150mm thick layers.

3.10.2 Tower cranes will be erected in suitable locations such as within the rear courtyard parking area.

3.10.3 The Contractor will install all basement level below ground drainage within concrete encasement protected with heave protection, including sump chambers and pumps.

3.10.4 The Contractor will cast the reinforced concrete basement raft slab, followed by the new reinforced concrete retaining walls. The new retaining walls will need to be temporarily propped at ground floor level with raking props. Propping to the base of the retaining walls may be required to support against sliding forces until the backfilling to the sloped site area is complete.

3.10.5 The Contractor will cast columns and core walls to ground floor, followed by the construction of the ground floor slab. Once the ground floor slab is cured and complete the temporary propping to the new retaining walls can be removed.

3.11 Stage 9: Superstructure

3.11.1 Once the ground floor slab is complete, the permanent superstructure core, walls columns and slabs can be constructed,

3.11.2 The strengthening and alteration works to the existing adjacent buildings could be undertaken concurrently with the basement construction, however the Contractor must consider and design for the stability and robustness of the existing buildings during the works.

4 Sustainability

4.1 Resource Efficiency

We have explored a philosophy of resource efficiency within our approach to the structural design of Gloucester Avenue. This approach goes beyond basic site waste management and aims to identify opportunities for innovation that maximise the use of valuable material resources and reduce waste production in construction through intelligent design.

4.2 Innovation opportunities

EWP have explored a number of innovations to be used during construction. These have been placed into two categories – those innovations which are considered feasible and those which have been considered, although found not to be practical for this application and reasons included. Each task has been graded from A-D as follows.

A- High impact on resource efficiency, easy to implement
B- High impact on resource efficiency, difficult to implement
C- Low impact on resource efficiency, easy to implement
D- Low impact on resource efficiency, difficult to implement

Feasible: Considered most appropriate for this application

Opportunity	Comment	Category	Actions taking forward
GGBS substitute in concrete mixes	Strength gain and loading requirements need to be reviewed by the contractor – typically concrete with 50 GGBS (Ground Granulated Blast-furnace Slag) content will not have significant impact on program. Local concrete supply chain needs to be identified to ensure GGBS is available (some batching plants only stock PFA and CEM1). We have specified PFA in the exposed lift shaft concrete as the Architect is looking for a dark grey concrete.	A	CEM II included in specification – explore higher percentages in raft slab with concrete suppliers – will assist with thermal cracking
20% coarse aggregate substitution in RC mixes and 100%	Stent is the term used to describe the waste granite rock material that has been separated from kaolin (china clay) by high-pressure water jets. For every tonne of china clay, approximately 4.5 tonnes of stent is produced along with other waste, which is usually tipped onto ever-growing surface	A	Allowed for in specification – Contractor to discuss with

in GEN 0 – GEN 3 concrete	spoil heaps.		supply chain
Contiguous piles replaced by reuse of retained structures within temporary works	This initiative is still under design development, however it has been proposed to retain the existing masonry walls in the temporary case and underpin/ prop as necessary, casting the new retaining wall in front.	A	In design for tender
Explore the use of lower strength concrete in basement and localised floor areas	High strength concrete has a higher total cementitious content and therefore higher cost and embodied carbon. Identification of areas that can accommodate a reduced strength concrete is therefore likely to have significant benefits for the project. This could be investigated within the basement raft.	A	To be reviewed with Contractor against programme and strength gain.
Use of brick slips on precast concrete	Increase quality and reduce on site waste and construction programme. This option will need to be discussed later in the design process.	B	Could be discussed with Contractor
Use of permanent formwork systems/initiatives to maximise formwork reuse	There is extensive use of formwork within the current designs. Marginally cost and resource efficiencies may be demonstrated through the use of permanent formwork solutions or investing in systems that can be reused numerous times without impacting on the quality of finish required	B	Tbc with contractor
Use of rebar rolls	The slab design is relatively straight forward with localised structural complexities which may therefore lend itself to use of rebar rolls to ensure efficient placement of steel and eliminated site off-cuts. However due to the nature of the flat slab design, its use is limited. Rebar rolls could be used for the retaining walls more easily.	B	To be discussed with Contractor
Ground improvement to allow raft foundation solution	The use of ground stabilisation techniques may enable a raft foundation solution to be developed. Clarification of below ground conditions required and complexities around differential movement will need to be explored. We have included for a backfill infill to the clay layer to allow a raft solution to be feasible.	C	Included in current design proposals

5 Party Wall Matters

The proposed works fall within the scope of the Party Wall etc Act 1996. Procedures under the Act will be dealt with in full by the Employer's Party Wall Surveyor. The Party Wall Surveyor will prepare and serve notices under the provisions of the Act and Agreed Party Wall awards. The Contractor will be required to provide the Party Wall Surveyor with appropriate drawings, method statements and other relevant information covering the works that are notable under the Act. The resolution of matters under the Act and provisions of the Party Wall Awards will protect the interests of the building and adjoining owners.

The proposed works will be developed so as not to inhibit any works on the adjoining properties. This will be verified by the Surveyors as part of the process under the Act. Network rail have been provided with the proposed scope of work previously discussed in section 1.3 and a comprehensive package including temporary works will be developed in the next stage in line with the planning conditions.

6 Proposed Drainage

A CCTV survey undertaken by GO Drainage has confirmed the existing drainage is a combined system (surface and foul water together) that all currently drains by gravity via two outlets to the 1422 x 838 combined public sewer in Gloucester Avenue. No third party drainage connections were discovered within the site during the CCTV survey.

Where buildings are demolished and re-built, new separated below ground drainage networks will be provided. Drainage within the retained buildings will be separated wherever feasible.

The proposed surface water discharge from the site has been designed following the drainage hierarchy. It is not possible to infiltrate surface water (due to the presence of London Clay across the site and areas of perched groundwater) and the nearby Regents Canal is not accessible. Therefore, discharge into the offsite Thames Water public combined sewer will be required. The primary form of attenuation will be through the use of a vortex flow control and geo-cellular crates; sections of green roofs will also assist in reducing the surface water discharge from the site. It is currently proposed to limit the maximum discharge rate into the public sewer to 5 l/s for all storms up to and including the 1 in 100 year return period plus allowance for 30% climate change.

Foul drainage will continue to drain by gravity wherever feasible. However, where new basements are constructed, the foul drainage will be pumped to high level.

Thames Water will need to be consulted and the necessary agreements obtained for all drainage works, including indirect connection applications and build-near agreements (for structural works close to the sewer in Sunny Mews).

7 Third Party Documents to be issued for Tender:

- Archive drawings
- Thames Water Records
- CCTV survey
- Site Investigation Report
- Ground Movement Analysis

8 Design codes and references

The structure has been designed in accordance with the design codes and reference documents listed in Table 8.1 Design codes of practice.

Table 8.1 Design codes of practice

Reference	Publication Date	Title
BS EN 1990 UK National Annex	2002 2005	Eurocode 0: Basis of structural design
BS EN 1991-1-1 UK National Annex	2002 2002	Eurocode 1: Actions on structures – General actions - Densities, Self-weight, imposed loads for buildings
BS EN 1991-1-3 UK National Annex	2003 2003	Eurocode 1: Actions on structures – General actions – Snow Loads
BS EN 1991-1-4 UK National Annex	2005 2010	Eurocode 1: Actions on structures – General actions – Wind Actions
BS EN 1992 UK National Annex	2004 2004	Eurocode 2: Design of concrete structures
BS EN 1993 UK National Annex	2005 2007	Eurocode 3: Design of steel structures
BS EN 1995 UK National Annex	2004 2004	Eurocode 5: Design of timber structures
BS EN 1996 UK National Annex	2005 2005	Eurocode 6: Design of masonry structures
NSSS	2007	National Structural Steelwork Specification 5th edition
NSCS	2010	National Structural Concrete Specification 4th edition
SCI Report P354	2009	Design of Floors for Vibration

9 Design Data

9.1 Permanent (Gk) and variable (Qk) floor loads

The following permanent and variable actions have been assumed in the design of the new structure. Variable actions are in accordance with BS EN 1991-1-1 2002 + UK National Annex.

Table 9.1 Permanent and variable floor loads

Description	gk (kN/m^2)	Gk (kN)	qk (kN/m^2)	Qk (kN)	Notes
<u>Building A</u>					
<u>Vaulted floor (level 0 to +2)</u>					
finishes	0.5				
Screed/Infill/masonry vaults,					
≈ 20kN/m^3 (250mm)	5				
ceiling & services	0.15				
residential (A1)			1.5	2.0	
partitions			1.0		
total	5.65		2.5	2.0	
<u>Building A</u>					
<u>Mezzanine floor (level +3)</u>					
finishes	0.5				
timber joists/board	0.35				
ceiling & services	0.15				
residential (A1)			1.5	2.0	
partitions			1.0		
total	0.75		2.5	2.0	

Description	gk (kN/m²)	Gk (kN)	qk (kN/m²)	Qk (kN)	Notes
<u>Building B</u>					
<u>Typical floor (level 0 to +5)</u>					
finishes (10mm)	0.5				
screed (75mm) 20kN/m³	1.5				
250-350mm thick RC Slab	6.25-8.75				
ceiling & services	0.5				
residential (A1)			1.5	2.0	
balconies (A5)			2.5	2.0	
partitions			1.0		
total	8.75-11.25		2.5	2.0	
<u>Building B</u>					
<u>Green Roof (level +5)</u>					
green roof (325mm thk)	2.35				Taken from similar project, revise once build-up known
250mm thick RC slab	6.25				
ceiling & services	0.5				
roof not accessible in normal circumstances (H)			0.6		
total	9.1		0.6		
<u>Building B</u>					
<u>Basement floor (level -1)</u>					
finishes	0.5				
screed (75mm) 20kN/m³	1.5				
750mm thick RC Slab	18.75				
storage (E11)			2.0	1.8	
partitions			1.0		
total	20.75		3.0	1.8	

<u>Building C & D</u> <u>Typical Floor (level 0 to +2)</u> finishes steel framing timber joists/board ceiling & Services residential (A1) commercial (B2) partitions total	 0.5 0.5 0.35 0.15 1.5		 1.5 3.0 1.0 2.5-4.0	 2.0 2.7 2.0-2.7	
<u>Building D</u> <u>Basement (level -1)</u> finishes screed (75mm) 20kN/m^3 750mm thick RC Slab commercial (B2) partitions total	 0.5 1.5 18.75 20.75		 3.0 1.0 4.0	 2.7 	

9.2 Permanent (Gk) façade loads

Table 9.2 Permanent façade loads

Description	gk (kN/m)	Gk (kN)	Notes
<u>typical masonary facade</u> 100mm thk 19kN/m^3 masonry	5.7		based on a floor to floor height of 3.0m
<u>Metsec sfs</u> PFC stud wall (0.4kN/m^2)	1.2		Based on a Floor to Floor Height of 3.0m
<u>Wall finishes</u> Plasterboard (0.1kN/m^2)	0.3		Based on a Floor to Floor Height of 3.0m

9.3 Wind loads

The wind loading has calculated using the wind loading code of practice BS EN 1991-1-4. Refer to appendix B for detailed information.

The parameters listed are provided for guidance only. Cladding and other specialist secondary designers should calculate their own specific wind pressures based on the codified guidance.

Table 9.3 Wind load parameters

Parameter	Value	Notes
Wind speed velocity ($V_{b,map}$)	21.4m/s	Refer to BS EN 1991-1-4 2005 Figure NA.1
Site Altitude (A_{alt})	20.0m	
Nearest distance to sea	66km	
Altitude factor (c_{alt})	1.020	$c_{alt} = A_{alt} \times 0.001m^{-1} + 1$
Fundamental basic wind velocity ($v_{b,0}$)	21.8m/s	$v_{b,0} = v_{b,map} \times c_{alt}$
Direction factor (C_{dir})	1.0	
Season factor (C_{season})	1.0	
Basic wind velocity (V_m)	21.8m/s	Refer to BS EN 1991-1-4 2005 Eqn 4.1 $V_m = c_{dir} \times c_{season} \times v_{b,0} \times c_{prob}$
Reference mean velocity pressure (q_b)	0.292kN/m^2	Refer to BS EN 1991-1-4 2005 Eqn 4.10 $q_b = 0.5 \times \rho \times V_b^2$
Exposure factor (C_e)	1.64	Refer to BS EN 1991-1-4 2005 Figure NA.7
Exposure correction factor ($C_{e,T}$)	0.76	Refer to BS EN 1991-1-4 2005 Figure NA.8
Peak velocity pressure (q_p)	0.36kN/m^2	Refer to BS EN 1991-1-4 2005 Eqn 4.8 $Q_p = C_e \times C_{e,T} \times q_b$

9.4 Snow loads

Snow loading has been calculated in accordance with BS EN 1991-1-3 2003+ UK National Annex.

Table 9.4 Snow load parameters

Parameter	Value	Notes
Zone Number (Z)	3	Refer to BS EN 1991-1-3 2003 Figure NA.1

Parameter	Value	Notes
Site Altitude (A)	18m	
Characteristic Snow Load (Sk)	0.35kN/m2	Sk = (0.15 + (0.1xZ+0.05))+((A-100)/525) (NA.1)
Snow Load Shape Coefficient (μ1)	0.88	Refer to BS EN 1991-1-3 2003 Table NA.1

10 Deflection criteria

The loading conditions applied for deflection check are in all cases un-factored. Deflection limits given in this section are in accordance with the governing design codes and established best practice.

10.1 Concrete elements

Table 10.1 Vertical deflection criteria for concrete

Element	Load Condition	Deflection Limit	Notes
Beams / Slab	$G_k + Q_k$	L/250	
Beams / Slab	Q_k + Creep	L/360 or 25mm* (whichever is less)	Normal Finish *Only applies for spans up to 10m
Beams / Slab	Q_k + Creep	L/500	Brittle Finish
Cantilever Beams	$G_k + Q_k$	L/125	
Cantilever Beams	Q_k + Creep	L/180	

10.2 Steel / Timber elements

Table 10.2 Vertical deflection criteria for steelwork

Element	Load Condition	Deflection Limit	Notes
Beams	$G_k + Q_k$	L/250	
Beams	Q_k	L/360 or 25mm* (whichever is less)	Normal Finish *Only applies for spans up to 10m
Beams	Q_k	L/500	Brittle Finish

Element	Load Condition	Deflection Limit	Notes
Cantilever Beams	$G_k + Q_k$	L/125	
Cantilever Beams	Q_k	L/180	

10.3 Horizontal elements

Table 10.3 Horizontal deflection criteria

Element	Load Condition	Deflection Limit	Notes
Columns / Wall	$Q_{k\ (Wind)}$	H/300	Normal finish
Columns / Wall	$Q_{k\ (Wind)}$	H/500	Brittle finish

11 Structural dynamics

It is necessary to assess the expected levels of footfall induced vibration in relation to the intended use of the building and design the building accordingly. The level of continuous vibration that can be accepted in different situations is expressed as a multiple of the vibration level at the threshold of human perception or base curve. The response factor (R) which is used to quantify the level of dynamic motion is simply a multiplier of this base curve or threshold of human perception.

Unless noted otherwise the occupied floor structure within the building will be designed to the SCI Report P354, Design of Floors for Vibration 2009. The application of this design guide leads to the dynamic performance criteria listed in table 4.1.

Table 11.1 Structural dynamics

Area	Natural Frequency Guide (Hz)[2]	Response Factor	Notes
Critical Area (Hospital)	N/A	1[1]	For specialist equipment refer to manufacturer
Office	4	4[1]	General Use
Residential	4	2[1]	Day Time
Stairs / Bridges	8	24	Heavy Use
Stairs / Bridges	8	32	Light Use

[1] Response or Multiplying factor resulting from a continuous single person walking excitation

[2] A simple check for natural frequency can be taken using $f=18/\sqrt{\partial}$

The figures given in the published guidance are not definitive as people's perception of acceptable motion will vary. In reality footfall induced vibration is also not continuous but intermittent. Human acceptance of intermittent vibration from footfall or other sources of vibration can be assessed in greater detail by combining vibration levels with the periods of time for which they are expected to occur to calculate a vibration 'dose' value or VDV. If the VDV approach is justified for use then assumptions about how often predicted levels of vibration will occur will be required.

Special conditions such as areas subject to rhythmic activities and stadia will require specific criteria to be developed and tested potentially through the use of more focused time history analysis.

Areas which host sensitive equipment such as microscopes and other clinical apparatus are likely to require dynamic performance which falls below the base curve of human perception (R=1). Guidance on the acceptable limits are provided in the form of BBN Velocity Criteria (VC) or ASHRAE criteria letters.

It should be noted that unless noted otherwise all dynamic analysis is undertaken with the assumptions of:

- 100% Dead + 10% Live Loads applied as mass (p354 4.1.2)
- Full rigid connection stiffness (p354 6.1.1)
- Dynamic modules of elasticity (E=38MPa) for concrete (p354 4.1.3)

12 Movement joints

Structural movement joints should be provided in accordance with the structural drawings.

13 Materials

13.1 Concrete

The following concrete grades and covers have been used for the various concrete elements:

Table 13.1 Properties of concrete

Element	Grade	Sulphate Class	Cover to reinforcement	Notes
Raft Slab	C40/50	DS3		Exposed to groundwater
Typical Slab	C40/50	N/A		Not Exposed
Columns/Walls	C40/50	N/A		Not Exposed

All concrete is designed in accordance with BS EN 1992- 2004 and BS EN 8500. All construction is in accordance with the National Structural Concrete Specification (NSCS).

13.2 Steel

All hot-rolled steel designed in accordance with BS EN 1993, strength grades are as listed in table 7.2

Table 13.2 Properties of steel

Element	Grade	Section Limit	Notes
Internal Steel	S355 JR	<30mm	
Internal Steel	S355 JO	>30mm	
External Steel	S355 J2	N.A.	

All construction is in accordance with the National Structural Steelwork Specification (NSSS).

All internal steelwork is assumed to be Corrosivity Category C1 (Very Low) according to BS EN ISO 12944-2-1998.

All external steelwork is assumed to be Corrosivity Category C3 (Medium) according to BS EN ISO 12944-2-1998.

13.3 Masonry

All masonry is assumed to be medium density 7 N/mm^2 strength non-load bearing and designed in accordance with BS EN 1996- 2005.

14 Additional criteria

14.1 Design life

In accordance with BS EN 1990 section 2.3 the primary frame design life of 50 years will be ensured for all elements through the correct detailing of each material.

Structural steel elements, where accessible, will be provided with an appropriate anti-corrosion paint protection system specified by the architect to provide a minimum life to first maintenance of 15-20 years.

14.2 Tolerances

Building tolerances unless noted otherwise shall be in accordance with the relevant National Specifications (NSSS & NSCS), good practice guides and BS 5606 Accuracy in Buildings.

A summary of typical construction tolerances based on BS5606 is provided in Table 8.1

Table 14.2 Tolerances

Element	Material	Tolerance	Notes
Column Verticality	Steel Timber In Situ RC Precast RC	6mm 10mm 12mm 10mm	BS 5606: 1990 Table 1
Floor height	Steel Timber In Situ RC Precast RC	+/-16mm +/-20mm +/-15mm +/-20mm	BS 5606: 1990 Table 1
Plan Position (columns)	Brick / Blockwork Steel Timber In Situ RC Precast RC	+/-10mm +/-10mm +/-10mm +/-12mm +/-10mm	BS 5606: 1990 Table 1

15 Geotechnical parameters

Reference should be made to the site investigation report prepared by GEA titled Desk Study & Basement impact assessment report dated August 2015. The principle findings and resulting impact on the design are listed in table 10.1

Table 15 Geotechnical Parameters

Item	Data	Impact on design
Underlying Geology	The site is underlain by a layer of made ground followed by London clay at depth.	Layer of infill to be included to ensure new raft bears onto good ground (the clay layer)
Hydrology	Perched groundwater found in parts of the site	Waterproofing to be considered in temporary and permanent conditions
Foundation Recommendations	Keep existing where possible, Deep RC rafts for new basements	As shown on drawings
Contamination	Not significant	n/a

16 Contractor Design Items

The following list covers the items which are considered as Contractor Design items under the agreed scope of works:

- Temporary works
- Steel to steel connections
- Staircases
- RC detailing
- Precast concrete elements
- Secondary steelwork including:
    - Masonry support systems
    - Metsec (or similar) frame
    - Access Ladders/ Walkways
    - Builders work/ Supports to services
    - Lift equipment/ guiderails and lifting beams
    - Glazing design including windows, full height openings, roof lights and fixing to primary structure. For the staircase by block A, the CDP package includes the steel superstructure framing to support the glazing – see design intent drawing.
    - Cladding including all fixings and framework required to connect it into the primary structure (primary structure is dictated as that shown on the structural drawings).
    - Louvre design and fixings back to primary structure
- Balustrade and handrails
- Design of non-loadbearing blockwork walls and other non-structural partitions

17.0 Design Programme Post Tender

			25/07/2016	01/08/2016	08/08/2016	15/08/2016	22/08/2016	29/08/2016	05/09/2016	12/09/2016	19/09/2016	26/09/2016	03/10/2016	10/10/2016	17/10/2016	24/10/2016	31/10/2016	07/11/2016	14/11/2016	21/11/2016	28/11/2016
Tender		8 weeks																			
RIBA Stage 5																					
Post demo survey		3 weeks																			
21A to confirm setting out of site & buildings		2 weeks																			
EW Construction Issue		2 weeks																			
Demo works		6 weeks																			
Construction																					
RC detailing of basement (by others)																					
Start on site	31/10/2016																				
Order rebar																					

EW Work

Design work by others

Contractor

Wimbledon
241 The Broadway
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fax. (020) 8544 0066

Central London
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